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DIFFICULTIES AND ACHIEVEMENTS OF THE USSR COAL INDUSTRY

PROBLEMS ENCOUNTERED IN DONBASS DEEP MINES -- Ugol', No 12, 53

As a result of the intensive working of Donbass coal deposits, the depth of mines is increasing rapidly, and, in the near future, workings in some of them will be extended to levels about 1,000 meters below the surface of the ground. Mines extracting coal for coking have increased in depth. This applies primarily to Stalino-Makiyevka, the central region, and Kadiyevka. In connection with the growth in the rate of coal extraction, it will soon be necessary to lay the foundations for and construct a number of mines, workings of which will in time reach a level of 1,000-1,400 meters or more. In the case of steeply dipping seams, the lower limits of the mine fields will be at a depth of about 2,000 meters.

Natural conditions in working deposits will be changed in proportion to the increasing depth of the mine. One of the most important factors influencing the working of deep deposits is the increase in the gas content of coal seams and the surrounding rock and, connected with that, the increase in the amount of methane in the mines. Investigations of G. D. Lidin have established the following data on amounts of methane to be expected in Donbass mines at varying levels:

Depth of Mines (meters)	Methane per Ton of Coal (cu m)
1-150	1.2
150-250	5.7
250-350	9.5
350-450	11.3
450-550	16.3
550-800	20.0

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The figures in the above table are the average for the basin. The amount of methane in specific seams may deviate greatly from these figures. According to the data of G. D. Lidin, the amount of methane in workings in certain seams was as high as 40-50 cubic meters and occasionally, higher.

Another problem exploiters of deep mines will have to cope with is the increase in temperature with the increase in depth. The geothermic step for the Donbass has been taken to be 30-35 meters. According to data of Glavuglegeologiya (Main Administration of Coal Geology) the temperature of rock increases approximately in a linear progression to an investigated depth of 1,200 meters. Consequently, to calculate the temperature at a depth of 1,000 meters, it is necessary to divide this figure by 30-35 and add the average yearly temperature of the Donbass, based on a number of years, which is 8 degrees. Thus the temperature of mine rock at a depth of about 1,000 meters should be approximately 38 degrees.

In 1952 the temperature of mine rock at a depth of 1,450 meters was taken in the Donbass. It proved to be 54 degrees, which corresponds to a geothermic step of 31.5 meters. Most recent data indicate that the size of the geothermic step, 30-35 meters, is only a rough average.

Investigations of Ya. N. Kashpur show that a far wider range in figures is observed in various places in the Donbass. It is indicated that there is a relation between the geothermic step and the tectonic structure of the area. An increase in temperature is more rapid in anticlinal structures than in synclinal ones. According to data from the Main Administration of Coal Geology, the geothermic gradient in the central region and in the Stalino-Makeyevka region is 29.4-31.6 degrees per kilometer, that is, a geothermic step of 34-31.6 meters. In the Krasnoarmeysk area, the geothermic gradient is 21.6-29.6 degrees per kilometer, corresponding to a geothermic step of 46.3-34.0 meters.

As to the water content of a coal seam, seams are usually drier at a depth than near the surface, except in the case of broken seams in particularly faulted zones containing crushed rock. Consequently problems of water drainage from very deep mines will be connected not with increased amounts of water but with the high pressure of the water to be pumped out.

A very difficult and only slightly studied problem connected with working deposits and, in particular, the deep deposits of the Donbass, is the problem of underground pressure. The amount of this pressure in a vertical direction is equal to the weight of a pillar of rock extending to the surface of the ground. If the specific gravity of the rock is taken to be 2.5, then the presssure at a depth of 100 meters is 25 kilograms per square meter; at a depth of 1,000 meters, it is 250 kilograms per square meter.

Exploration of mine fields for deep mines presents special requirements. A number of exploratory boreholes should be pushed to the necessary minimum and, in drilling each hole, the most complete possible information about the deposit should be obtained.

In Stalino-Makeyevka, according to data of the Artemuglegeologiya Trust, exploratory work is being carried out to a depth of 1,200-1,500 meters. In the Krasnoarmeysk and Dobropol'ye area levels at lesser depths are being explored but, in places, the depth of the boreholes exceeds 1,000 meters. In the south wing of the main anticline in the central region, it is necessary to drill to a depth of 1,500-2,200 meters; in the north wing, somewhat less.

According to data of Glavuglegeologiya, about 25 sections have been explored in Stalino-Makeyevka and Krasnoarmeysk with the goal of constructing deep mines.

Deposits at a great depth should be worked by mines with a high yearly output and with a lengthy life span. Only under these conditions will the mine fields have supplies adequately large for the amortization of the large capital outlay necessary for constructing such mines.

KUZBASS MINE DECREASES EXPENDITURE -- Moscow, Ugol', No 12, 53

Five years ago Mine No 9/15 of the Anzherougol' Trust of the Kuzbassugol' Combine became a profitable enterprise and each year it is achieving new successes in improving the quality figures of its work. During the past 5 years, the mine's average daily output has increased 26 percent or 943 tons per day. The monthly productivity for the mine rose per laborer from 27.6 tons in 1949 to 45.6 tons in 1953 (average for 8 months), or 65 percent. In August 1953 productivity of the workers reached 49.5 tons instead of a planned 48.5 tons.

Production costs per ton of coal dropped 32 percent during the same period, and, because of reduced production costs, the mine achieved savings as follows: in 1949, 3,880,000 rubles; in 1950, 4,030,000 rubles; in 1951, 2,980,000 rubles; in 1952, 1,190,000 rubles; in 8 months of 1953, 740,000 rubles.

To eliminate dispersion of mining operations, the number of sections was decreased for the mine from 19 to 14 and the number of working faces was lowered from 17 to 13. The extent of mine workings was also decreased from 57.3 kilometers on 1 January 1949 to 52.9 kilometers on 1 January 1953, or by 8 percent.

The average monthly productivity of one face rose in 1953 to 9,380 tons as compared to 5,394 tons in 1949. The average length of the face was 109 meters in 1953 as against 75 meters in 1949, an increase of 45 percent.

The carrying out of these measures permitted cutting the amount of development work in half per thousand tons of extraction, from 41.3 linear meters in 1949 to 22 linear meters in 1953. The number of operating development fronts decreased from 94 to 45 and the proportion of coal extracted from development work dropped from 16.7 percent to 12.7 percent.

At present, 60 percent of all working faces have been converted to the cycle work schedule and about 70 percent of the coal extracted is from these faces. Faces converted to the cycle work schedule have advanced more than 26 percent compared with faces not on the schedule and labor productivity has increased 61 percent above that of ordinary faces.

Introduction of the following technical measures has stepped up labor productivity:

1. Shaker conveyers have been completely replaced by scraper conveyers. This has made it possible to increase the line of the face and to make the face more productive. Idleness of the face caused by accidents from inadequate mechanisms have become a rare phenomenon.

2. Regulations for propping the face have been revised by increasing the firmness of the face props. This has permitted reduction of the obstructions at the face to one fourth.

3. A quicker method of transferring the scraper conveyers has been mastered and the time needed for installing the organpipe props has decreased considerably.

4. Supplying the face with mine timbers has been improved. Three years ago the mine experimented with conveying timbers to the faces by scraper conveyers operating along the emergency exit. This led to a decrease in the number of workers employed for conveying timbers, from 393 persons on 1 January 1949 to 156 on 1 September 1953.

Each year production costs of coal are reduced as compared to the preceding year. In 5 years all items of expense in addition to amortization have been reduced, as shown by the following table:

Items of Expense	1952 (in % of 1949)	7 Months of 1953 (in % of 1949)	Percent of Total Production Costs 1949	1953
Materials	67.0	66.0	19.4	18.4
Fuel	78.0	61.0	0.2	0.2
Electric power	83.0	78.0	2.2	2.5
Wages	72.5	67.0	64.0	62.4
Extras for wages	74.5	70.0	5.5	5.6
Amortization	144.0	136.0	2.8	5.4
Other monetary expenses	70.0	62.5	6.0	5.5
Total	73.5	69.0	100.0	100.0

The following table indicates how Mine No 9/15 reduced consumption of timbers and blasting materials:

Consumption per 1,000 t of Output	1949	7 Months of 1953	1953 in Percent of 1949
Mine times (cubic meters)	67.0	58.6	87.5
Explosives (grams)	163.0	121.0	74.0
Electric detonators (number)	389.0	299.0	77.0

Ths use of mine timbers transported from a distance increases considerably the production costs per ton of coal. The mine paid 3.3 million rubles to the railroad in 1949, 2.6 million rubles in 1950, 1.6 million in 1951, 1.9 million in 1952, and 1.1 million in 8 months of 1953. The use of local supplies of mine timbers would be an important measure in the further decrease in production costs of a tone of coal.

In 1952, 5 percent of the mine's coal was extracted by combines and cutting machines, 20 percent by pneumatic drill, 64.3 percent by blasting, and 10.7 percent by manual labor.

According to conditions of the Anzherskiy deposit, the highest labor productivity is achieved at faces cutting coal with pneumatic drills. Taking into consideration that the majority of seams in the mine are medium hard

and soft and that there are great disturbances in the deposit, further increase in labor productivity makes necessary a conversion to mechanized removal of coal by pneumatic drills and the stepping up of this method of mining to 70 percent of the total output of the mine in the next 2 years.

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